Jones J, Serwicka I, Wren C.

Economic integration, border costs and FDI location: Evidence from the fifth European enlargement.

International Review of Economics and Finance **2017**

DOI: https://doi.org/10.1016/j.iref.2017.08.007

ECONOMIC INTEGRATION, BORDER COSTS AND FDI LOCATION: EVIDENCE FROM THE FIFTH EUROPEAN ENLARGEMENT

Jonathan Jones[a], Ilona Serwicka[b] and Colin Wren[a]*

[a] Economics, Business School, Newcastle University,
5, Barrack Road, Newcastle upon Tyne,
England, UK, NE1 4SE
[b] Department of Economics, University of Sussex,
Falmer, Brighton, England, UK, BN1 9RH

ABSTRACT

Little is known about the effect of border costs on FDI location. This paper explores this for the fifth European Union (EU) enlargement that integrated the Central and Eastern European countries (CEECs). It regresses count data for 35,105 FDI projects locating in 25 European countries over the period 1997-2010. Four EU accession events are examined for the more- and less-liberalized CEECs. It finds that the lower border costs doubled FDI in the CEECs at membership, but of which 60% is diverted from the 'old' Europe. This membership effect is three-times greater for the more-liberalized countries, but earlier events are unimportant.

Keywords: FDI location; border costs; economic integration, European enlargement; Central and Eastern European Countries.

JEL Classification: F150; F210; P330.

* Corresponding Author. Tel +44 (0) 191 2081644; email colin.wren@ncl.ac.uk .

Acknowledgements

Earlier versions of this paper were presented at staff seminars at the Department of Economics, Hull University, 2016 and the Department of Land Economy, Cambridge University, 2014, and conferences at INFER, Reus, 2016 and the European Regional Science Association, Palermo, 2013. The authors are grateful to participants at these events and David Barlow, Simona Iammarino, Roxana Radulescu and John Wildman. Financial support from the ESRC Spatial Economics Research Centre and the Peter and Norah Lomas graduate scholarship programme are gratefully acknowledged. Thanks also go to Ernst and Young for supplying the investment data. The paper has greatly benefitted from the comments of anonymous referees, but the usual disclaimer applies.

1. INTRODUCTION

There is considerable research on how border costs affect trade (McCallum, 1995; Anderson and Wincoop, 2004; Coughlin and Novy, 2012), but relatively little on how these costs affect foreign direct investment (FDI). Standard theory predicts that horizontal FDI is discouraged when trade costs fall, but Neary (2009) notes that this conflicts with recent experience where trade liberalization is associated with a strong increase in FDI. A major reason for this is the formation of trade blocs, with firms establishing greenfield plants abroad as low-cost export-platforms (see Ekholm *et al*., 2007; Krugman and Venables, 1990). Integration may also lead to brownfield FDI if a multinational enterprise (MNE) consolidates its plants (Neary, 2008). Despite this theory, there is little empirical evidence on how border costs affect FDI location. This paper remedies this deficiency by drawing on the experience of the fifth enlargement of the European Union (EU) to examine how the lower border costs affected FDI location. This enlargement added more than 100 million citizens to this trade bloc from the ten countries of Central and Eastern Europe (the 'CEECs'), creating the world's largest single market.[1]

The enlargement removed the internal border checks for the new accession countries in the form of waiting time and administrative costs (Hornok, 2008). These are difficult to measure, but in aggregate they are estimated to be around ten per cent of the trade costs of the CEECs with the 'old' Europe (Edwards, 2008). Membership did not involve substantial tariff reduction, as these were agreed under the earlier Association Agreements, while the technical and non-tariff barriers (i.e. regulations and product standards) also did not change sharply at this time. The accession process lasted up to seven years from the start of negotiations until membership and the economic and political liberalization of the CEECs was integral to this. This poses a potential threat to identification but the approach of this paper is to focus on key

[1] The CEECs are the ten former communist states that joined the EU in 2004 and 2007, i.e. mainly Eastern Bloc countries west of the former Soviet Union, plus the Baltic States. The former Yugoslavia was not part of this Bloc, but Slovenia joined in 2004 and so is included. Croatia joined in a sixth enlargement in 2013.

accession events and to examine these for more- and less-liberalized CEECs. From this it is possible to infer that the effect of the lower border costs occurs at membership. In particular, if EU membership is just a commitment to future liberalization then we would expect a larger effect for the less-liberalized countries. Further, if FDI locates to anticipate the lower border costs at membership then we would expect the earlier accession events to be important.

The FDI data are sourced from the *European Investment Monitor*, which is compiled by Ernst and Young (see Defever, 2012). This comprises information on 35,105 cross-border investments locating in the ten CEECs and fifteen incumbent Member States ('EU15') over 1997-2010. These are greenfield and brownfield FDI, where the latter is a re-investment by a MNE at its existing plant. The data are analyzed as project counts for each country and year using a fixed effects panel regression for the twenty-five countries. Four accession events are examined: the commencement of negotiations; European Council commitment to enlarge; the conclusion to negotiations at which the membership date was announced; and membership. These are evaluated separately for the more- and less-liberalized CEECs, where these entered the accession process at different times owing to their different liberalization. A contribution of the paper is to examine the extent to which the FDI location is diverted to the CEECs from the EU15. It involves regressing a log-linear model for both the share and level of projects. The error structure allows for the smaller level of FDI in the CEECs and for the possibility of any inefficiency in data collection in the CEECs prior to the accession negotiations.

Overall, the paper finds that EU membership had a substantial effect on the FDI in the CEECs, more than doubling the number of the projects locating in these countries compared to before the commencement of the accession negotiations. As other changes were relatively unimportant at this time then this is due to the lower border costs from the removal of border checks that led to a reduction in waiting time and administrative costs. The FDI effect varies with the liberalization of a country, so that the increase in FDI location is three-times greater

for the more-liberalized CEECs. It is also greater for less-liberalized CEECs in the run-up to membership, which is consistent with their liberalization under the enlargement process. The net effect of FDI location for the EU is much smaller as 60% of the projects in the CEECs at membership were diverted. Nevertheless, the lower border costs had a substantial impact on FDI location in the CEECs, but which depends on the level of liberalization.

The next section describes the key accession events and the nature of the border costs. Section 3 discusses the empirical framework and Section 4 outlines the nature of the FDI and other data. Section 5 presents the regression results and Section 6 concludes.

2. EU ACCESSION AND THE BORDER COSTS

Following the collapse of communism a formal set of criteria for the EU membership of the CEECs was set out in June 1993. These are the Copenhagen criteria that embody conditions related to political and economic liberalization (Christoffersen, 2007).[2] The criteria for the political liberalization of a CEEC had to be satisfied before the negotiations could commence with it, whereas the economic liberalization measures had to be implemented by membership and enforced thereafter, so these were part of the negotiations. Applications for membership were received from the CEECs over 1994-96, and four key accession events are identified in Table 1. The events vary in their timing according to a three-fold classification of the CEECs that is the same grouping used by Bevin and Estrin (2004), except that Slovenia is included. The groups also differ by their liberalization, which is useful for our identification strategy.

[Table 1 here]

[2] The political criterion concerns a stable institutional set-up to guarantee democracy, rule of law and protection of human rights, whereas the other two criteria relate to a fully functioning market economy and the acceptance of EU law, but which together correspond to economic liberalization (Rode and Gwartney, 2012). In the run-up to negotiations the 1994 Essen Pre-Accession Strategy helped the CEECs prepare for the Single Market through structured relationships with the EU's institutions and the gradual adoption of EU law.

In relation to liberalization, the CEECs were screened in the run-up to a 1997 Luxembourg Summit of European Ministers, and following this the negotiations commenced with five of these, which (with Cyprus) were known as the Luxembourg Group (Table 1). The other five CEECs were judged to be not sufficiently liberalized either to satisfy the economic criteria in the medium-term or in the case of Slovakia on the basis of its political liberalization, so that these are the less-liberalized countries. Their negotiations followed a 2000 Helsinki Summit, and (with Malta) they were known as the Helsinki Group. As regards the accession events in Table 1, a 2000 Road Map sped-up negotiations with some of the Helsinki Group, such that a commitment to enlarge was made at a 2001 Laeken European Summit (Christoffersen, 2007). This approved plans to bring the negotiations with eight of the CEECs to a close by the end of 2002. A further European Council meeting announced that enlargement would take place in May 2004. A timetable was agreed for Bulgaria and Romania, and at the Brussels Council meeting in December 2004 it was announced that they would join in 2007 (see Table 1).

2.1. Border Costs and FDI Location

EU membership gives full access to the European Single Market, which is more complete for goods than services and brings obligations concerning the free movement of goods, services, capital and people (Egan, 2015). Since its establishment in January 1993 the Single Market has sought to dismantle internal trade barriers by removing the tariffs, technical trade barriers (e.g., regulations on consumer protection, health and safety and the environment), non-tariff barriers (i.e. product standards) and border controls between the Member States. Association Agreements, known as Europe Agreements, were signed with the CEECs over 1991-96 and these phased out statutory EU tariffs on industrial goods (Baldwin *et al*., 1997). Remaining tariffs and restrictions were removed at membership, but these mainly affected agriculture, while a common EU external tariff was introduced as part of the customs union.

The main benefit for trade between the CEECs and EU15 at membership, and hence for export-orientated FDI, was the reduction in border costs, which removed internal border checks (Hornok, 2008). Hummel *et al*. (2007) estimate that the cost of a day's waiting is the same as an *ad valorem* tariff of 0.8%, but in addition the administration costs were substantial and compounded when crossing several borders. Technical and non-tariff barriers were less important at this time, especially if the firm was already located in or trading with the Single Market. Many technical barriers were agreed prior to negotiations and Chen (2004) finds that non-tariff barriers had no effect on trade within the EU15. Other integration measures were also unimportant since the Euro was adopted by only two CEECs by 2010 and the Schengen Agreement on the movement of individuals did not apply to the CEECs until 2007.

In aggregate, the border costs are estimated to be 5% to 20% of trade costs for many industries in the CEECs relative to the EU15 (Edwards, 2008), averaging around 10%. While the proximity-concentration hypothesis suggests horizontal FDI takes place when production costs in the host country are low and trade costs are high, Lankes and Venables (1996) argue that a reduction in trade costs will be the major benefit for FDI location. This is because the new accession countries offer a low-cost production site and the lower border costs improves access to the European markets (Krugman and Venables, 1990). Thus, not only may FDI in the CEECs reflect a vertical motive for FDI, but from a horizontal perspective it may be an export-platform (Ekholm *et al*., 2007). EU enlargement may also favour plant consolidation (Neary, 2008), whereby plants are closed or investment is foregone elsewhere in the union.

The empirical evidence for the effect of the lower border costs mainly relates to trade (see Magerman *et al*. 2015). Otherwise the evidence for FDI location in the CEECs is largely in the lead-up to enlargement and so prior to membership. Perhaps the most cited study is by Bevan and Estrin (2004), who find a positive and significant estimate for an ordinal dummy for the CEECs that are most likely to accede (3, 2 and 1 for the groups in Table 1). Clausing

and Dorobantu (2005) examine EU announcements prior to negotiations and they find that the Copenhagen criteria had a significant effect on FDI in both the Luxembourg and Helsinki Groups, but that the negotiations format is important for the latter group only, so that it could just be a commitment to liberalization. Flam and Nordström (2007) find the Single Market increased FDI by 85% between 1995-98 and 2002-06, but do not identify the CEECs. Using US-EU trade data Ekholm *et al*. (2007) find support for the export-platform motive.

3. EMPIRICAL FRAMEWORK

To estimate the effect of EU accession on FDI location the model is specified as:

$$\ln FDI_{it} = \alpha + \beta EU_{it-1} + \beta' x_{it-1} + \gamma \ln FDI_{t} + \delta_i + \varepsilon_{it}, \qquad (1)$$

where FDI_{it} is the count of the number of investment projects in country i at year t, EU_{it} are dummies for the four accession events in Table 1, x_{it} are country-level controls, δ_i are country fixed effects and ε_{it} is the error term. The FDI_t term is measured contemporaneously with the dependent variable, but reverse causality is rejected below. Equation (1) is regressed using a fixed effects panel estimation across the ten CEECs and fifteen EU15 Members States, where together these are referred to as the 'EU25'. The annual mean count of projects per country is 100 projects, so equation (1) is a good approximation to the Poisson model. It is preferred to a conditional logit model that is much less flexible for examining location over time.

The semi-log specification of (1) is advantageous in enabling the diversion of FDI to be explored. In particular, when $\gamma = 0$ the term for the total number of projects locating in the EU25 in year t (i.e. ln FDI_t) is omitted and (1) is an equation in the 'FDI level'. However, if $\gamma \neq 0$ then (1) is an equation in the 'FDI share', which can be seen by rearranging (1) as:

$$\ln\left(\frac{FDI_{it}}{FDI_{t}}\right) = \alpha + \beta EU_{it-1} + \beta' x_{it-1} + (\gamma - 1)\ln FDI_{t} + \delta_{i} + \varepsilon_{it} . \qquad (1')$$

Appendix A shows that regressing (1) both as a level and a share the ratio of the β estimates for each accession terms reveals the proportion of projects that would otherwise have located elsewhere in the EU25. It also shows that for each accession term the β estimate is no greater for the share compared to the level, so that this ratio is bounded above by unity. In each case the β estimate measures a proportionate effect, which for a dummy variable is exp β - 1. As the FDI share lies on the unit interval equation (1′) is also regressed using a logistic function, and this involves replacing ln (FDI_{it} / FDI_t) with ln (FDI_{it} / (FDI_t - FDI_{it})).[3]

The estimating equation does not include time fixed effects. These are meaningless if (1) is regressed as an FDI share as it is not possible for an unobserved effect to either increase or decrease the share in every region in some year. Further, if (1) is regressed as an FDI level it is not possible to implement the methodology since in this case the EU_{it} terms capture a net FDI location effect in the CEECs over and above that of the EU15. It is zero if, for example, enlargement gives confidence to investors in the EU15 and increases FDI in these countries in the same proportion, as the effect is picked-up by a time fixed effect. As we see, including time fixed effects in the level regression gives similar results to the FDI share as they capture the ln FDI_t term. Econometrically, the omission of time fixed effects can be justified as the controls x_{it} vary greatly across countries, but little over time, implying that these fixed effects have large standard errors and are imprecisely determined (Allison, 2009). It is also difficult to think of any time fixed effects that simultaneously affect FDI location in the EU25 and the timing of the accession events, since the latter is governed by the negotiation process.

[3] Let p be the project share, then the inverse of the logistic function, $p = 1 / (1 + 1 / \exp z)$), is the log-odds ratio, ln (p / (1 - p)) = z, where z is the right-hand side of (1′). If $p = FDI_{it} / FDI_t$ then ln (FDI_{it} / (FDI_t - FDI_{it}) = z.

The hypothesis that is investigated is that the EU membership term captures the effect of the lower border costs. This is explored by estimating the EU_{it} accession terms for each of the Luxembourg and Helsinki Groups. As we have seen, these had different entry dates into the accession process that reflected their level of liberalization, and this enables inferences to be drawn. If membership is a commitment to future liberalization we expect a larger estimate to be found for the less-liberalized CEECs. Further, if FDI locates to anticipate the lower border costs the announcement terms should be significant, including for the more-liberalized CEECs. In these respects, the end of negotiations is an important event since the membership date was announced at this time. The accession announcements are likely to be a useful way of capturing the liberalizing effect of the EU accession process in the less-liberalized CEECs as they signal progress in meeting the Copenhagen criteria for liberalization.

3.1. Estimation Approach

The FDI data are part-sourced from national investment agencies, but if weaker institutions in the CEECs prior to accession mean that they under-report FDI then this will bias upwards the β estimates in equation (1). To address this potential inefficiency in FDI data collection, ε_{it} in (1) is specified as a compound normal-half normal error term (Aigner *et al*., 1977). This is a widely used stochastic frontier model. Letting $\varepsilon_{it} = v_{it} - u_{it}$, where $v_{it} \sim N(0, \sigma_v^2)$, $u_{it} = |U_{it}|$ and $U_{it} = N(0, \sigma_u^2)$, the log-likelihood function is specified as (Greene, 2011):[4]

$$\ln L = -\frac{n}{2}\ln\left(\frac{2}{\pi}\right) - \frac{n}{2}\ln\left(\sigma^2\right) - \frac{1}{2}\sum_i\sum_t\left(\frac{\varepsilon_{it}}{\sigma}\right)^2 + \sum_i\sum_t \ln\Phi\left(\frac{-\varepsilon_{it}\lambda}{\sigma}\right), \qquad (2)$$

[4] A potential difficulty with the stochastic frontier model is the 'wrong skew' problem (see Simar and Wilson, 2010), but the residuals from the OLS estimation of (1) are negatively skewed, so that σ_u^2 is identified. The normality of v is accepted in the literature and Greene (1990) finds no difference between the main alternatives for u. Estimation of (1) using the *frontier* command in Stata fails to converge if ln FDI_t is included.

where $\sigma^2 \equiv \sigma_u^2 + \sigma_v^2$, $\lambda \equiv \sigma_u / \sigma_v$ and Φ is the cumulative standard normal distribution. By letting the error variances depend on i and t, and hence on the accession events EU_{it}, then it is possible to test and control for a possible inefficiency in FDI data collection:

$$\sigma_{uit} = \alpha_u + \beta_u \, EU_{it} \geq 0 \quad \text{and} \quad \sigma_{vit} = \alpha_v + \beta_v \, EU_{it} > 0 . \tag{3}$$

The first of these allows the variance of the half normal term to vary with accession. If there is a general inefficiency in data collection then $\alpha_u > 0$, and if it is greater for the CEECs prior to an event EU_{it} then $\beta_u < 0$. The second corrects for heteroskedasticity since if the CEECs get a relatively lower level of FDI prior to membership, it is expected that $\beta_v < 0$. Equation (2) is regressed using maximum likelihood (Gould *et al*., 2010), where ε is given by (1) and the error variances σ and λ by (3). In fact, the α_u and β_u estimates do not differ significantly from zero, which means that (2) is subsequently regressed with $\sigma_u = 0$ (i.e. $\sigma^2 \equiv \sigma_v^2$ and $\lambda = 0$), so that ε_{it} is normally distributed.[5] When $\beta_v = 0$ this gives identical parameter estimates to Ordinary Least Squares (OLS), albeit with smaller standard errors owing to the correction for the degrees of freedom. However, there are advantages from maximum likelihood regression as it enables us to correct for the smaller level and share of FDI in the CEECs prior to each of the accession events, including EU membership (see Table 2 below).

4. DATA AND VARIABLES

The FDI data are from the *European Investment Monitor* (EIM), which gives details of cross-border investment in the EU25 from 1997. It comprises greenfield and brownfield FDI that

[5] The normality of ln FDI_{it} is not rejected by the data (Jarque-Bera = 2.97; $\chi^2_{0.10} = 4.61$). Regressing the model using OLS it is necessary to increase four project counts from 1 to 2 to ensure that the skewness-kurtosis test for normality is satisfied for the residuals (Jarque-Bera = 1.66 for the log-linear model in the FDI level). This was also the case for the different categories of investment shown in Figure 2 below.

add to a country's gross assets, so that for practical purposes mergers and acquisitions are not included, for which different motives apply (Basile, 2004).[6] The EIM identifies the location decision, which is otherwise difficult to ascertain.[7] It gives the characteristics of each project, including activity, ownership and scale, where the jobs are known for 62% of projects (the investment expenditure for only a third). National agencies, financial information providers and media outlets are used to construct the EIM (Defever, 2012) and Ernst and Young (2012) claim to monitor 20,000 data sources, contacting most firms to validate the data.

The EIM identifies 35,105 projects in the EU25 over 1997-2010, with each country receiving FDI in each year. Two-thirds of the projects are greenfield FDI and the remainder are brownfield FDI, where the latter include the plant consolidations that lead to expansions.[8] About 60% of projects are in manufacturing, and the main (ultimate) country of ownership is the EU15 (46%), followed by the Americas (34%; mainly the USA) and Asia (12%; Japan). Other investment is primarily from elsewhere in Europe, with just 1% from the CEECs.

[Table 2 and Figure 1 here]

The CEECs received a fifth of the projects over 1997-2010, and Table 2 shows its location by country. About 60% of FDI is in the Czech Republic, Hungary and Poland, which had strong transitions over the 1990s (Resmini, 2000). The Helsinki Group receives less FDI, but these entered the process later due to their weaker liberalization, of which Bulgaria and Romania had difficult privatizations (Kalotay, 2008). Generally, the increase in the number of projects after membership is much greater for Helsinki Group, and while the mean job scale is similar

[6] The EIM excludes portfolio investment and license agreements, but includes a small number of joint ventures. It is narrower than the UNCTAD definition. It does not include extraction, utility, retail and leisure activities. Neither does it include Cyprus and Malta prior to their membership, but these received little relevant FDI.
[7] Aggregate FDI data are in net terms and include 'special purpose entities' that act as holding companies for tax purposes, accounting for up to 90% of FDI in some EU15 countries (OECD, 2014). The correlation between the aggregate EIM and UNCTAD data is 0.86 for annual FDI inflows, notwithstanding the different definitions.
[8] Plant closures and investment foregone are not observed. Further, plant consolidation could involve a location at a wholly new site, which is greenfield investment, although these are likely to be small in number.

for the Luxembourg Group it is larger for the countries that get more projects. The FDI share for the CEECs is plotted over time in Figure 1. This peaks for the Luxembourg Group when they joined the EU in 2004 and likewise for Bulgaria and Romania in 2007. The share of FDI in the CEECs from the EU15 is 62%, and surprisingly this hardly varies by year.

4.1. Accession Variables

The EU_{it} accession dummies are coded to unity for all years after an event. This includes the year of the event if it is in the first six calendar months. They are zero for the EU15, but this is without significance as (1) includes country fixed effects. On the same basis dummies are added for 1, 2 and 3 years after membership to help interpret the results. The 'time-to-plan' lag from planning to construction can be substantial, but the projects are dated by the year of announcement, for which the 'time-to-build' lag is much shorter (Millar *et al*., 2012). The accession events span nine years and no event has the same date across all the CEECs (Table 1). Of the fourteen years covered by the data CEEC membership is on average observed for half this, i.e. 6.4 years. The EIM was not produced prior to 1997. A positive and significant β estimate indicates that an event caused FDI to increase over its previous share or level.

4.2. Country Variables

The x_{it} controls in equation (1) are measured for each country. Details of their expected sign, source and measurement are given in Appendix B. Using a conditional logit model Serwicka *et al*. (2017) show that the motives for FDI location differ between the EU15 and CEECs, so that these estimates are allowed to vary between these. Correlation coefficients are given in Serwicka *et al*. (2016) and are nearly always less than 0.40, but multicollinearity is explored by dropping terms. The estimates for the accession terms without the x_{it} are given below and

a broadly similar pattern is found. The controls are external to the firm, but internal sources of heterogeneity such as from greenfield and manufacturing FDI are considered below.

A market potential term is included to capture European market access:

$$\text{EU Market Potential}_{it} = \sum_{\substack{j \in \text{EU25} \\ j \neq i}} \frac{GDP_{jt}}{s_j d_{ij}}. \quad (4)$$

This is measured for each country i and year t, where GDP_{jt} is the GDP of country j, d_{ij} is the distance between the capital cities of i and j, and s_j is the intra-country distance of j, given by the radius of a disk with the same land area (Amiti and Javorcik, 2008). It supposes that the capital city is a functional centroid and that the inter-country distance proxies transport costs, as measured by the *AA Route Planner*. An alternative measure performs poorly for the EU15 (Head and Mayer, 2004). This does not allow for border effects, which is reasonable for the EU15 as these are in the Single Market throughout. In the case of the CEECs it is interacted with EU membership, which allows for the possibility that countries closer to the 'West-East' border gain more FDI. The national GDP level and growth rate are also included.

The production costs are captured by the manufacturing wage rate, while like Resmini (2000) general labour availability is measured by the unemployment rate. The secondary and tertiary education rates are included for each of semi- and high-skilled labour, where negative signs for both these capture unskilled labour. Institutional quality is proxied by a composite index for political risk (Busse and Hefeker, 2007), where a higher value indicates lower risk. The index captures relatively low risks in the EU25, such as a weaker regulatory regime, that may be viewed favourably (Bevan and Estrin, 2004). The corporate tax rate is added for rent seeking and the EU Structural Funds as it is used to support infrastructure.

A range of integration terms is included, where these may differ in their sign between the EU15 and CEECs (see Serwicka *et al*., 2016). Association Agreements are picked-up by

a trade liberalization term for trade openness. The 'MNE / exporters / domestics' paradigm implies that trade and FDI are substitutes (Neary, 2008), but Carstensen and Toubal (2004) find complementarity for the CEECs in the transition period, which is when a firm may test a market by exporting. It includes imports and so does not simply capture the export-platform motive. A dummy is included for Eurozone membership, which reduces bilateral transaction costs and could stimulate FDI, perhaps by giving confidence to investors in the CEECs, but it could also promote exports and so reduce FDI if these are substitutes. The exchange rate also has an ambiguous effect as an increase makes exports more costly, while increasing the value of repatriated profits. It is deflated by the consumer price index, so that it also captures a loss of international competitiveness from inflation. Finally, exchange rate volatility is included.

5. REGRESSION RESULTS

5.1. EU Membership

The likelihood function in equation (2) is regressed as a panel across $i = 25$ countries and $t = 14$ years from 1997 to 2010, giving $n = 350$ observations. Initially, it is with the membership term only, but subsequently all of the accession events are included, which are then examined for the more- and less-liberalized countries. The regression results with the membership term are presented for the FDI share ($\gamma \neq 0$) and level ($\gamma = 0$) in the first two columns of Table 3. In each case the σ_u estimates are insignificant, which suggests that there is no inefficiency in FDI data collection prior to or after EU membership, so that these terms are omitted.[9]

The country controls are included for the EU25, but with slope dummies on each term for the CEECs. In general, it can be seen that they have the same signs between the share and

[9] When EU membership is omitted the σ_u coefficients are significant, but this gives confidence in the approach.

level equations in columns I and II of Table 3, and that up to half of the terms are significant. They show that there are a large number of significant differences in these between the EU15 and CEECs and that the sign can differ, but consistent with our above prior expectations. Of interest, EU market potential has a positive effect in the CEECs and the wage rate is negative, so that these are a low-cost-export platform, but otherwise these are essentially uninteresting controls.[10] Trade and FDI are substitutes in the CEECs, which is counter to Carstensen and Toubal (2004), but consistent with the MNE / exporters / domestics paradigm.

[Table 3 here]

Columns I and II show that EU membership has positive and significant effects on the share and level of FDI location in the CEECs. When evaluated they are 28% and 89% respectively (e.g. exp 0.635 - 1 = 0.89). As expected, the share estimate is less than that for the level, but the extent to which FDI is diverted to the CEECs is evaluated below for the full model.

The remainder of Table 3 examines the effect of different estimating equations. Each supposes $\gamma = 0$ in (1). Column III imposes a normal error term with constant variance, so that the OLS coefficient estimates are obtained. Compared to column II the membership estimate is robust.[11] Column IV uses the logistic function and again similar results are found for the membership and other terms. Finally, column V includes the time fixed effects and as noted above it gives a similar membership result to the share regression in column I. It does not support the inclusion of these fixed effects since some estimates are unsatisfactory, such as negative effects for EU market access and national GDP. It is probably because there is little variation in the controls over time for each country, making their inclusion inappropriate.

[10] When interacted with EU membership, EU market potential term is significant at the 10% level in column II.
[11] The model in equation (1) with $\gamma = 0$ was also regressed directly using OLS with the standard errors clustered at the country level. This gives identical parameter estimates. EU membership continues to be significant at the 1% level, but some country terms lose significance including the wage rate and Structural Fund terms.

5.2. EU Accession Events

Column VI of Table 4 estimates the share equation in column I with all four accession terms and column VII includes the post-accession terms for up to three years after EU membership. These are repeated in columns VIII and IX for the model in the level ($\gamma = 0$). Each includes the country controls and they allow the error variance to vary with accession according to the events identified in Table 1, although neither is reported to save space. The accession terms estimate the effect across all CEECs and they give a similar pattern for the share and level. FDI increases with the commitment to enlarge and at membership, but falls away two years after EU membership. The peak at membership suggests the lag length is about right.

[Table 4 here]

The remainder of Table 4 carries out robustness checks, which again is for the level model. First, column X omits the country controls, and while the membership is reasonably robust to this, the announcement terms are now greater than the respective estimates in column IX. As the first of these is most affected it suggests that the controls are advantageous in picking-up the events prior to this time, such as the trade liberalization and other measures taken to enter the negotiations. Second, column XI includes time fixed effects, but like columns I and V the membership estimate is similar to the share regression, although the announcement terms are insignificant. Third, column XII regresses the model for FDI that originates from the EU15. Since the Association Agreements largely removed the EU15 tariffs and non-tariff barriers on CEEC goods prior to membership, this helps to control for the common EU external tariff at EU membership. Once again there is a positive and significant effect for membership, which at 151.2% (= exp 0.921 - 1) is much greater than that for all FDI, at 97.8% in column IX. As a final exercise, column XIII regresses equation (1) using OLS, clustering the standard errors

at the country level. This gives similar parameter estimates to the comparable ML model in column IX, while like elsewhere some of the announcement terms are significant.

5.3. More- and Less-Liberalized Countries

To draw inferences about the hypothesis, the accession terms are estimated separately for the Luxembourg and Helsinki Groups in Table 5, where these are the more- and less-liberalized CEECs respectively. Column XIV gives the result for the FDI shares. As noted above, there could be a simultaneity bias between ln FDI_{it} and ln FDI_t in equation (1), but excluding the larger host countries of France, Germany and the UK from column XIV the estimates for the membership term are qualitatively similar. The ln FDI_t estimate is greater than unity due to the strong growth of FDI in CEECs with small FDI shares (Table 2), but it is not significantly different from unity. Column XV shows that the membership parameter estimates are greater if γ is constrained equal to unity, but those in column XIV are preferred as they are consistent with column VII in which γ is also freely estimated. Finally, column XVI reports the results for the FDI level, and again the membership estimates are greater than for the FDI share.

[Table 5 here]

The respective estimates on the EU accession terms in Table 5 are evaluated in Table 6 along with those for all CEECs, where each is expressed in cumulative terms relative to the period prior to the accession negotiations. Across all CEECs they show that FDI more than doubled by membership whether it is measured as a share or level (127.2% and 172.6% respectively). The key announcement is the commitment to enlarge, although its effect is generally smaller than the membership accession event. In either case, FDI location falls away about two years after membership, and this is more pronounced for the share than for the level.

Table 6 shows important differences in the accession events between the Luxembourg and Helsinki Groups. First, accession as a whole has much stronger effects on FDI location in the Helsinki Group by EU membership whether it is the share or level. Indeed, three years after membership its FDI share nearly doubles, at 86.6%, whereas for the Luxembourg Group it is only 8.9% higher. Second, and related this, the announcements have stronger effects in the Helsinki Group, so that by the end of the negotiations FDI location nearly doubles in both the share and level, at 87.9% and 76.3% respectively. By contrast, FDI in the Luxembourg Group is largely unresponsive to the announcements, at 20.1% and 0.0% respectively.

[Table 6 here]

Finally, in relation to EU membership the FDI location effect is stronger for the Luxembourg Group compared to the Helsinki Group. Calculated relative to the end of the negotiations, and so directly from Table 5, the respective increases in FDI location in the membership year for the Luxembourg and Helsinki Groups are 46.2% and 38.8% for the FDI share but 131.6% and 78.1% for the level.[12] Again, larger effects are found for the level compared to the share. If evaluated they reveal that just over 40% of projects are diverted to the Luxembourg Group from elsewhere in the EU25 at membership, but which is even higher for the Helsinki Group at about 70%.[13] Since the diversion of FDI relates to the EU25 as a whole, and the Helsinki Group acceded after the Luxembourg Group (Table 1), then it is consistent with the Helsinki Group drawing FDI away from the Luxembourg Group. Overall, the estimates indicate that about 60% of FDI at EU membership was diverted within the EU25 to the CEECs.[14]

At the mean project gross job size shown in Table 2 the estimates reveal that an extra

[12] From column XVI of Table 5 we find exp 0.577 - 1 = 78.1%. This can be reconciled with the cumulative FDI effects shown in Table 6 by noting that (213.9% + 1) / (76.3% + 1) = 78.1% + 1.
[13] Appendix A shows that the ratio of the estimated coefficients for the FDI level and share is $1 + a / n$, implying that $a = \{(2.316 / 1.462) - 1\} \times n \equiv 0.58\, n$ for the Luxembourg Group but $a = 0.28\, n$ for the Helsinki Group, where in the former case exp 0.840 = 2.316 and exp 0.380 = 1.462 for EU membership from Table 5.
[14] From Table 4, we get $a = \{(\exp 0.682 / \exp 0.350) - 1\} \times n \equiv 0.39\, n$.

85 projects and 19,250 jobs located in each Luxembourg country in the membership year and that 26 projects and 6,150 jobs located in each Helsinki country at that time, which is about a third of that in the Luxembourg Group.[15] These seems large when compared with the annual number of projects given in Table 2, but Table 6 shows that FDI subsequently fell away.

[Figure 2 here]

To examine heterogeneity, Figure 2 plots the evaluated coefficients for different categories of investment for each of the Luxembourg and Helsinki Groups. These are in cumulative terms for the level regression. They include the final two columns of Table 6, FDI originating from the EU15, which as noted above helps control for the external tariff, and in the latter case for manufacturing, greenfield and brownfield FDI. The manufacturing FDI plot closely follows that for all FDI, although after membership there is a divergence and this suggests that FDI from outside the EU15 became more important. Figure 2 shows that brownfield FDI is more important for FDI location in the Luxembourg Group, but that greenfield FDI matters more for the Helsinki Group. It reflects the greater liberalization of the Luxembourg Group, which entered the accession process earlier and so received brownfield FDI at EU membership. By contrast, the Helsinki Group tended to receive greenfield investment at membership.

5.4. Discussion of the Results

The results are consistent with Clausing and Dorobantu (2005), who find that announcements prior to the negotiations are important for FDI in the Helsinki Group only. Bevan and Estrin (2004) find a stronger FDI effect for the Luxembourg Group in the run-up to EU membership but this is for 1994-2000, so that it may just capture the effect of the Association Agreements.

[15] The mean annual projects per country for the Luxembourg Group is 64.7 (= 4530 / 5 × 14 from Table 2), and multiplied by the FDI increase at membership of 131.6% gives 85.1 projects. The mean number of jobs is 226, which gives 19,250 total jobs. For the Helsinki Group these are 33.6 × 78.1% = 26.2 projects and 6,150 jobs.

We find that FDI location in the CEECs falls substantially after membership, which is a new finding, and we believe that this is not due to a global event such as the 2008 Financial Crisis. This is because it is evident for the FDI share, while in the case of the Luxembourg Group it pre-dates the Financial Crisis. It could just reflect an uncoordinated first-mover response to EU enlargement, with FDI then settling down to its new long-run equilibrium level.

As regards the hypothesis, the results indicate that the lower border costs from Single Market access affect FDI location at membership. This is because they are inconsistent with alternative explanations. In particular, they do not suggest that FDI anticipates membership, as this date was announced at the end of negotiations and it does not significantly affect FDI location for either of the two groups shown in Table 5. Indeed, each announcement has a weak effect for the Luxembourg Group. Further, the results do not suggest that membership is simply a commitment to the future liberalization of the CEECs as a larger EU membership effect is found for the more-liberalized Luxembourg Group. A commitment to liberalization for the less-liberalized Helsinki Group appears to have occurred earlier in the process as the commitment to enlarge has a significant effect on FDI location in these countries.

The interpretation that EU membership captures the effect of the lower border costs is plausible, as FDI is mobile and it is likely to wait until the lower trade costs are effective to take advantage of this. The lower border costs mainly comprise the reduction in waiting time and administrative costs from the elimination of border checks, which are reckoned to have reduced trade costs between the CEECs and the 'old' Europe by around ten per cent.

6. CONCLUSIONS

This paper explores the effect of EU accession on FDI location in the accession countries of Central and Eastern Europe in order to examine the effect of the lower border costs. Overall,

it finds that EU membership had a substantial effect on the FDI location in the CEECs, which more than doubled the number of the projects locating in these countries compared to before the commencement of the accession negotiations. This effect varies greatly with a country's liberalization, as captured by the date it was allowed to enter into the accession negotiations. In particular, it is three-times greater for the more-liberalized CEECs in terms of the number of both projects and jobs, while there is strong growth in FDI in the run-up to membership for the less-liberalized CEECs, consistent their greater liberalization as part of the enlargement process. In general, the results show that the lower border costs can have substantial effects on FDI location, which depends crucially on the liberalization of the host economy.

The methodology pursued in the paper reveals that about 60% of the projects locating in the CEECs at membership were diverted to the CEECs from the existing Member States, so that the net effect for the enlarged EU as a whole is much smaller. This is even greater for the less-liberalized CEECs that entered the EU accession process later, for which greenfield FDI is much more important, but consistent with the CEECs operating as an export-platform for the 'old' Member States. By contrast, brownfield FDI is relatively more important for the more-liberalized CEECs and this may reflect the plant consolidations at EU membership. An implication of the paper is that the existing literature on the fifth enlargement, which focuses on the period prior to membership, has mainly captured its liberalizing effect. Finally, while at the time of writing the nature of Brexit is yet to be determined, a further implication of the paper is that higher trade costs will adversely affect FDI location throughout the EU.

Table 1: Key EU Accession Events for CEECs

Accession event	'Luxembourg Group'	'Helsinki Group'	
	Estonia, Czech Republic, Hungary, Poland and Slovenia	1: Latvia, Lithuania and Slovakia	2: Bulgaria and Romania
Commencement of negotiations	31st Mar 1998	15th Feb 2000	15th Feb 2000
Commitment to enlargement	15th Dec 2001	15th Dec 2001	13th Dec 2002
Conclusion of negotiations	13th Dec 2002	13th Dec 2002	17th Dec 2004
EU membership	1st May 2004	1st May 2004	1st Jan 2007

Table 2: Location of FDI Projects in the CEECs, 1997-2010

	Total Projects		Mean Annual Projects				Mean Project Gross Job Size
			Before EU Membership		After EU Membership		
	Number	EU25 Share (%)	Number	EU25 Share (%)	Number	EU25 Share (%)	
Luxembourg Group:	4,530	12.90	267	9.79	381	16.60	226
Estonia	234	0.67	15	0.56	18	0.80	89
Czech Republic	1,152	3.28	73	2.66	92	4.01	260
Hungary	1,413	4.03	95	3.49	107	4.66	218
Poland	1,613	4.59	81	2.97	150	6.52	232
Slovenia	118	0.34	3	0.11	14	0.60	123
Helsinki Group:	2,350	6.70	133	6.30	248	7.93	234
Latvia	181	0.52	10	0.35	16	0.71	61
Lithuania	239	0.68	12	0.45	22	0.95	99
Slovakia	529	1.51	19	0.70	57	2.46	306
Bulgaria	470	1.34	42	2.19	45	1.11	202
Romania	931	2.65	50	2.61	108	2.69	258
CEECs:	6,880	19.60	400	16.09	629	24.53	224
EU15:	28,225	80.40	2,086	83.91	1,935	75.47	80

Notes: Jobs are known for 62% of all projects.
Source: EIM dataset.

Table 3: Results for EU Membership

	Share		Level		OLS		Logistic Function		Time Fixed Effects	
Dependent variable:	ln (FDI_{it} / FDI_t)		ln FDI_{it}		ln FDI_{it}		ln (FDI_{it} / (FDI_t - FDI_{it}))		ln FDI_{it}	
Column:	I		II		III		IV		V	
σ_{vit}: Constant α_v	0.276***		0.295***		0.268***		0.279***		0.262***	
EU membership β_v	-0.057***		-0.063***		-		-0.054***		-0.053**	
EU membership	0.244***		0.635***		0.606***		0.218***		0.188**	
Country controls x_{it-1}:	EU25	CEECs	EU25	CEECs	EU25	CEECs	EU25	CEECs	EU25	CEECs
EU market potential (x 10^{-3})	-6.524	43.916*	-1.500	26.631	-1.500	21.871	-7.367	45.748*	-28.228***	-14.259
Host GDP (x 10^{-6})	-0.029	-1.220***	0.0278	-1.450***	0.028	-1.570***	-0.039	-1.220***	-0.066**	-1.290***
Host GDP growth rate (x 10^{-2})	0.292	2.692***	0.853	1.873	0.853	2.034	0.113	2.940**	-0.947	4.015***
Real wage rate (x 10^{-2})	-5.004***	-11.293**	-5.413***	-9.291*	-5.413***	-9.154*	-5.739***	-10.922**	-10.477***	-1.897
Secondary education (x 10^{-2})	1.577***	-0.262	1.683**	-1.014	1.683**	-1.208	1.502**	-0.145	0.963*	-0.353
Higher education (x 10^{-2})	2.285***	-0.410	4.272***	-2.556**	4.272***	-2.374*	2.269***	-0.358	0.376	0.143
Labour availability (x 10^{-2})	-2.021*	7.676***	-0.218	5.777***	-0.218	5.812***	-2.414**	8.129***	-1.831	7.371***
Institutional quality (x 10^{-2})	0.689	-1.652	2.155***	-3.293***	2.155***	-3.341***	0.640	-1.541	0.478	-1.031
Corporate tax rate (x 10^{-2})	-0.215	-2.897***	-0.766	-2.847***	-0.766	-3.152***	-0.252	-2.918***	0.712	-3.466***
EU Structural Funds	0.019	0.165**	0.057*	0.166**	0.057*	0.174**	0.013	0.169**	0.018	0.198**
Trade liberalization (x10^{-2})	3.192	-8.158*	5.721*	-8.754*	5.721*	-7.530	3.591	-8.718**	2.841	-6.310
Eurozone membership	-0.015	0.783***	-0.138*	0.977***	-0.138*	1.036***	-0.006	0.777***	-0.154*	1.045***
Exchange rate (x 10^{-2})	-0.338	-0.240	1.482***	-2.163***	1.482***	-2.066***	-0.338	-0.166	0.508	-1.085*
Exchange rate volatility (x 10^{-2})	-0.727	0.723	-0.222	0.212	-0.222	0.215	-0.820	0.817	-2.381**	2.392**
ln FDI_t	-0.061		-		-		-		-	
Constant α	-2.493**		3.288***		3.316***		-2.590***		7.469***	
n	350		350		350		350		350	
Log-likelihood	519.3		478.4		322.8		503.5		554.3	

Notes: ML estimation of (1), (2) and (3), with $\sigma_u = 0$ and $\gamma = 0$ in columns II to V. Country fixed effects included throughout. *** = 1%, ** = 5% and * = 10%.

Table 4: Results for the EU Accession Process

Dependent variable: ln FDI_{it}	Share		Level		Level			
Origin countries:	All	All	All	All	All	All	EU15	All
Column:	VI	VII	VIII	IX	X	XI	XII	XIII
EU_{it-1}:								
Negotiations commence	0.317***	0.199**	0.162*	0.110*	0.236**	-0.002	0.181*	0.116
Commitment to enlarge	0.321***	0.272***	0.234*	0.211*	0.239*	0.169	0.184*	0.187*
Negotiations conclude	-0.097	-0.169	0.004	-0.019	-0.012	-0.120	-0.110	-0.012
EU membership	0.286***	0.350***	0.626***	0.682***	0.623***	0.270**	0.921***	0.686***
Membership + 1 year	-	-0.127*	-	-0.061*	0.003	-0.006	-0.071	-0.064
Membership + 2 years	-	-0.274***	-	-0.147*	-0.243***	-0.337***	-0.272**	-0.156**
Membership + 3 years	-	-0.118	-	-0.009	-0.068	-0.153	-0.077	-0.001
ln FDI_t	-0.011	0.097	-	-	-	-	-	
Constant α	-3.406***	-3.425***	2.896***	3.155***	3.073***	7.448***	3.505***	3.165**
Country controls x_{it-1}?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Time fixed effects?	No	No	No	No	No	Yes	No	No
n	350	350	350	350	350	350	350	350
Log-likelihood	532.3	542.2	491.2	493.3	363.6	569.6	350.1	-
R^2	-	-	-	-	-	-	-	0.93

Notes: ML estimation of (2) with (1), (3) and $\sigma_u = 0$ in columns VI to XII, and OLS estimation of (1) with clustered standard errors at a country level in column XIII. Columns VIII to XIII set $\gamma = 0$ in (1). Country fixed effects included throughout. *** = 1%, ** = 5% and * = 10%.

Table 5: Results for the Luxembourg and Helsinki Groups

	Share				Level	
Column:	XIV		XV		XVI	
EU_{it-1}:	Luxembourg	Helsinki	Luxembourg	Helsinki	Luxembourg	Helsinki
Negotiations commence	0.042	0.298**	0.050	0.305***	-0.092	0.226*
Commitment to enlarge	0.183*	0.333**	0.053	0.308*	0.071	0.341**
Negotiations conclude	-0.077	-0.201	-0.062	-0.180	-0.050	0.040
EU membership	0.380**	0.328**	0.563***	0.349**	0.840***	0.577***
Membership + 1 year	-0.248*	0.006	-0.242*	0.015	-0.180*	0.072
Membership + 2 years	-0.229*	-0.335**	-0.205	-0.319**	-0.046	-0.272**
Membership + 3 years	-0.157	-0.097	-0.136	-0.064	-0.101	0.036
ln FDI_t	1.086		= 1		= 0	
Constant α	-3.114***		-2.750***		3.480***	
n	350		350		350	
Log-likelihood	544.9		496.9		497.8	

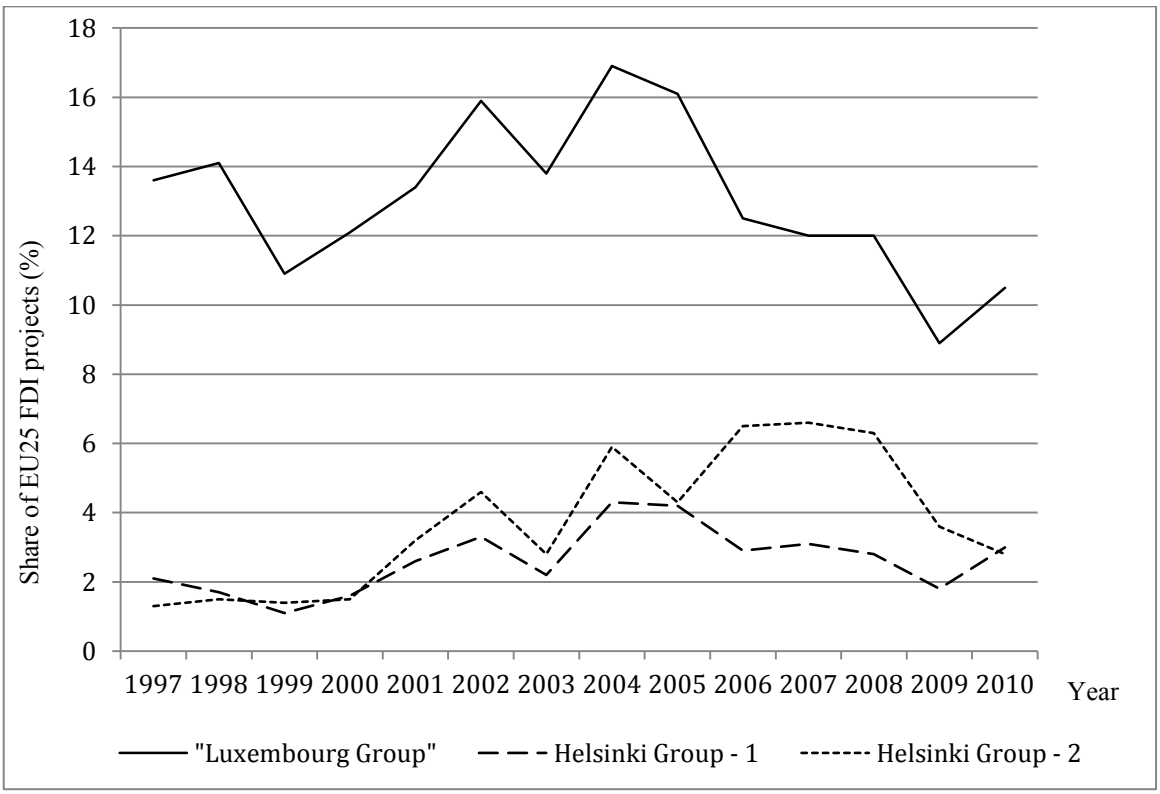
Notes: ML estimation of (2) with (1) and (3), where $\sigma_u = 0$. EU_{it-1} terms in spline form for Luxembourg and Helsinki Groups in Table 1. Country controls for CEECs and EU15 and country fixed effects included but not reported. *** = 1%, ** = 5% and * = 10%.

Table 6: Evaluation of Cumulative FDI Location Effect

	Share			Level		
Accession event	All CEECs (%)	Luxembourg Group (%)	Helsinki Group (%)	All CEECs (%)	Luxembourg Group (%)	Helsinki Group (%)
Negotiations commence	22.0	0.0	34.7	11.6	0.0	25.3
Commitment to enlarge	60.2	20.1	87.9	37.9	0.0	76.3
Negotiations conclude	60.2	20.1	87.9	37.9	0.0	76.3
EU membership	127.2	75.6	160.9	172.6	131.6	213.9
Membership + 1 year	100.2	37.0	160.9	156.5	93.4	213.9
Membership + 2 years	52.2	8.9	86.6	121.4	93.4	139.2
Membership + 3 years	52.2	8.9	86.6	121.4	93.4	139.2

Notes: Cumulative % change in FDI relative to before negotiations. Based on columns VII and IX of Table 4 and XIV and XVI of Table 5 (e.g. All CEECs FDI share at membership from column VII is exp (0.199 + 0.272 - 0.169 + 0.350) - 1 = 113.2% in above table). Significant changes shown only and the groups defined in Table 1.

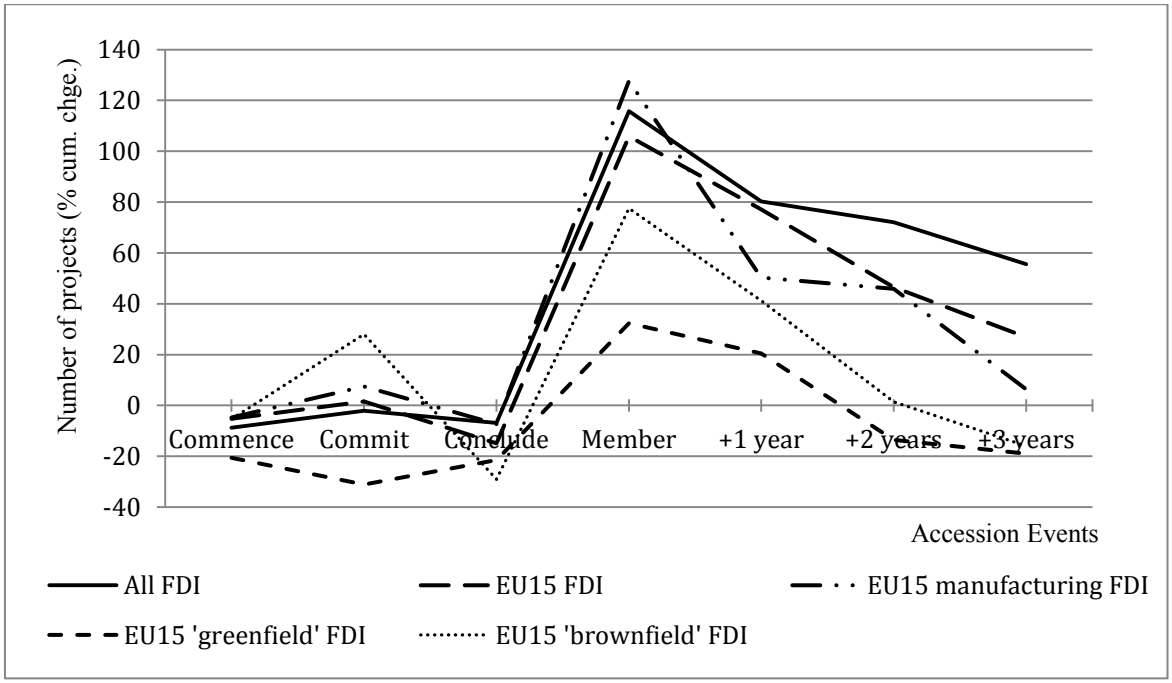
Figure 1: FDI Shares in the CEECs



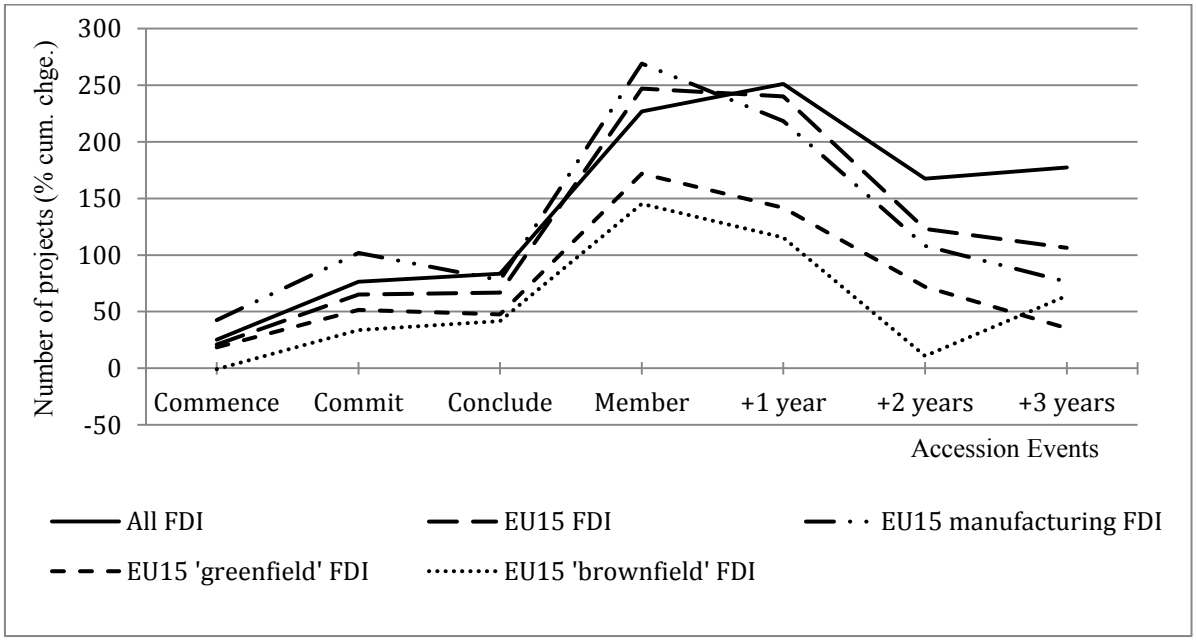
Notes: Groups defined in Table 1.
Source: EIM dataset.

Figure 2: Effect of EU Accession Process by FDI Type

(a) Luxembourg Group



(b) Helsinki Group



Notes: Estimation of column XVI for projects with different characteristics originating from EU15. A small number of joint-owned projects from different global regions excluded. Zero project counts are increased by one and cases of a single project increased by one to ensure normality. Coefficients evaluated in cumulative terms, as in Table 6. Groups and accession events defined in Table 1.

Appendix A: The Measured Effect and 'Diverted' FDI

	EU15	CEECs	Proportionate change in CEECs	
			Level	Share
Prior to accession	m	$n - m$	-	-
Case I: 'Diverted' FDI	$m - d$	$n - m + d$	$1+\frac{d}{n-m}$	$1+\frac{d}{n-m}$
Case II: 'Additional' FDI	m	$n - m + a$	$1+\frac{a}{n-m}$	$\left(1+\frac{a}{n-m}\right)\Big/\left(1+\frac{a}{n}\right)$
Case III: Both	$m - d$	$n - m + d + a$	$1+\frac{d+a}{n-m}$	$\left(1+\frac{d+a}{n-m}\right)\Big/\left(1+\frac{a}{n}\right)$

Notes: For Case III the proportionate change for the level is $(n - m + d + a) / (n - m)$, while that for the share is $\{(n - m + d + a) / (n + a)\} / \{(n - m) / n\}$, from which the Cases I and II follow (i.e. $a = 0$ or $d = 0$).

Suppose there are n FDI projects in the EU25 prior to accession, of which m ($< n$) are in the EU15. Three accession cases are shown in the table: Case I: d ($< m$) projects are 'diverted' to the CEECs from the EU15; Case II: a 'additional' projects locate in the CEECs that are a net increase in FDI to the EU25; and Case III: both of these. In terms of the proportionate effect, the table shows that the level and share give the same effect for Case I, and that Cases I and II are observationally equivalent for the level. However, the level gives a larger effect than the share for Case II, which is the same if FDI is both 'diverted' and 'additional', as in Case III. In these latter cases the ratio of the level to the share is $1 + a / n$, which is unity only if $a = 0$, so FDI is wholly 'diverted'. These are for the CEECs as a group, but dividing the numerator and denominator of each expression by the number of CEECs yields identical results.

Appendix B: The Data

Variable	Mean	Standard Deviation	Min.	Max.	Expected sign
Foreign direct investment:					
FDI_{it}	100.3	144.0	1	818	
ln FDI_{it}	3.82	1.33	0	6.71	
ln (FDI_{it} / Σ_i FDI_{it})	-3.98	1.30	-7.79	-1.09	
ln (Σ_i FDI_{it})	7.80	0.23	7.45	8.09	
Accession dummies, EU_{it}:					
Commencement of negotiations	0.34	0.47	0	1	+
Commitment to enlargement	0.25	0.43	0	1	+
Conclusion to negotiations	0.22	0.41	0	1	+
Membership	0.18	0.39	0	1	+
Membership + 1 year	0.15	0.36	0	1	+
Membership + 2 years	0.13	0.33	0	1	+
Membership + 3 years	0.10	0.30	0	1	+
Country control variables, x_{it}:					
EU market potential (€ bn / km)	36.56	15.65	14.54	83.91	+
Host GDP (€ bn)	418.7	612.3	6.06	2,400	+
Host GDP growth rate (%)	2.98	3.81	-17.7	11.7	+
Wage rate (€)	13.80	11.81	0	80.2	-
Secondary education rate (%)	50.59	15.60	10.8	80.2	?
Higher education rate (%)	20.58	8.02	2.31	42.61	?
Labour availability (%)	8.45	3.90	1.8	22.1	+
Institutional quality (index, 1 to 100)	81.58	7.07	65	96.5	?
Corporate tax rate (%)	29.07	8.25	10.0	56.8	-
EU Structural Funds (€ bn)	1.24	1.87	0	9.80	+
Trade liberalization (%)	77.76	33.94	27.1	186.3	?
Eurozone membership (dummy)	0.42	0.49	0	1	?
Exchange rate (2005 = 100)	97.29	10.28	53.8	134.3	?
Exchange rate volatility	9.33	69.17	0.02	1090	?

Data Measurement and Source:
Controls are sourced from *Eurostat*, unless otherwise stated, with monetary units in euros at 2005 prices using an EU deflator. Those not described in table or text are as follows. Wage rate is hourly compensation in manufacturing (*International Labor Comparisons*, US Bureau of Labor Statistics); not known for Bulgaria, Latvia, Lithuania, Luxembourg, Romania and Slovenia, for which an unreported dummy is included. Highest educational attainment of 25-64 year-olds at ISCED levels 3-4 and 5-6 (World Bank). Institutional quality (*International Country Risk Guide*, Political Risk Services); zero risk = 100. Trade liberalization is (exports + imports) / GDP (*International Financial Statistics,* IMF). Real effective exchange rate for 36 major trading partners. Volatility is absolute change in exchange rate in preceding year. Tax is adjusted top statutory corporate tax rate (DG for Taxation and Customs Union, European Commission). EU Structural Funds outturn (DG for Regional Policy).

REFERENCES

Aigner, D., C. Lovell and P. Schmidt, "Formulation and Estimation of Stochastic Frontier Production Function Models", *Journal of Econometrics*, 6:1 (1977), 21-37.

Allison, P. D. (2009), *Fixed Effects Regression Models*, Quantitative Applications in the Social Sciences, Sage Publications, Los Angeles.

Amiti, M., and B. Smarzynska Javorcik, "Trade Costs and Location of Foreign Firms in China", *Journal of Development Economics*, 85:1 (2008), 129-49.

Anderson, J. and van Wincoop, E., "Gravity and Gravitas: A Solution to the Border Puzzle", *American Economic Review*, 93:1 (2003), 170-92.

Baldwin, R.E., J. F. Francois and R. Portes, "EU Enlargement: Small Costs for the West, Big Gains for the East", *Economic Policy*, April (1997), 127-76.

Basile, R., "Acquisition versus Greenfield Investment: The Location of Foreign Manufacturers in Italy", *Regional Science and Urban Economics*, 34:1 (2004), 3-25.

Basile, R., D. Castellani and A. Zanfei, "Location Choices of Multinational Firms in Europe: The Role of EU Cohesion Policy", *Journal of International Economics*, 74:2 (2008), 328-40.

Bevan, A. and S. Estrin, "The Determinants of Foreign Direct Investment into European Transition Economies", *Journal of Comparative Economics*, 32:4 (2004), 775-87.

Brainard, S. L. "An Empirical Assessment of the Proximity-Concentration Trade-off Between Multinational Sales and Trade", *American Economic Review*, 87:4 (1997), 520-44.

Busse, M. and C. Hefeker, "Political Risk, Institutions and Foreign Direct Investment", *European Journal of Political Economy*, 23:2 (2007), 397-415.

Carstensen, K. and F. Toubal, "Foreign Direct Investment in Central and Eastern European Countries: A Dynamic Panel Analysis", *Journal of Comparative Economics*, 32:1 (2004),

3-22.

Chen, N., "Intra-National Versus International Trade in the European Union: Why Do National Borders Matter?", *Journal of International Economics*, 63 (2004), 93-118.

Christoffersen, P. S., "Organization of the Fifth Enlargement" in G. Vassiliou (Ed.), *The Accession Story* (New York: Oxford University Press, 2007).

Clausing, K. A. and C. L. Dorobantu, "Re-entering Europe: Does European Union Candidacy Boost Foreign Direct Investment", *Economics of Transition*, 13:1 (2005), 77-103.

Coughlin, C. and Novy, D., "Is the International Border Effect Larger than the Domestic Border Effect? Evidence from U.S. Trade", *GEP Research Paper 2009 / 29*, University of Nottingham, UK.

Defever, F., "The Spatial Organization of Multinational Firms", *Canadian Journal of Economics*, 45:2 (2012), 672-97.

Disdier, A-C. and T. Mayer, "How Different is Eastern Europe? Structure and Determinants of Location Choices by French Firms in Eastern and Western Europe", *Journal of Comparative Economics*, 32:2 (2004), 280-96.

Edwards, H., "Implicit Trade Costs and European Single Market Enlargement", *Applied Economics*, 40:20 (2008), 2601-13.

Ekholm, K., R. Forslid and J. R. Markusen, "Export-Platform Foreign Direct Investment", *Journal of the European Economic Association*, 5:4 (2007), 776-95.

Ernst and Young, *European Investment Monitor* (London: Ernst and Young, 2012).

Flam, H. and H. Nordström, "The Euro and Single Market Impact on Trade and FDI", *mimeo* (Stockholm University: Institute for International Economic Studies, 2007).

Gould, W., J. Pitblado and B. Poi, *Maximum Likelihood Estimation with Stata* (Texas: Stata Press, 2010)

Greene, W. H., "A Gamma-Distributed Stochastic Frontier Model", *Journal of Econometrics*, 46:1-2 (1990), 141-64.

Greene, W. H., *Econometrics Analysis* (New Jersey: Pearson Education, 2011).

Head, K. and T. Mayer, "Market Potential and the Location of Japanese Investment in the European Union", *The Review of Economics and Statistics*, 86:4 (2004), 959-72.

Hornok, C., "Trade Without Borders: Trade Effect of EU Accession by Central and Eastern European Countries", *Forum for Research in Empirical International Trade*, *Working Paper No. 30*, (2008).

Hummels, D., P. Minor, M. Reisman and E. Endean, *Calculating Tariff Equivalents for Time in Trade* (Arlington, VA: Nathan Associates for the United States Agency for International Development, 2007).

Kalotay, K., "Russian Transnational and International Investments Paradigms", *Research in International Business and Finance*, 22:2 (2008), 85-107.

Krugman P. and A. J. Venables, "Integration and the competitiveness of peripheral industry", in C. Bliss and J. Braga De Macedo (Eds), *Unity with Diversity in the European Economy: The Community's Southern Frontier* (Cambridge: Cambridge University Press, 1990).

Lankes, H-P. and A. J. Venables, "Foreign Direct Investment in Economic Transition: The Changing Pattern of Investments", *Economics of Transition*, 4:2 (1996), 331-47.

Magerman, G., Z. Studnicka and J. Van Hove, "Distance and Border Effects in International Trade: A Comparison of Estimation Methods", *Economics Discussion Papers, No 2015-69* (Kiel: Kiel Institute for the World Economy, 2015)

McCallum, J., "National Borders Matter: Canada-US Regional Trade Patterns", *American Economic Review*, 85:3, (1995), 615-23.

Millar, J. N., S. D. Oliner and D. E. Sichel, "Time-to-Plan Lags for Commercial Construction Projects", *Finance and Economics Discussion Series, 2012-13* (New York: Federal

Reserve Board, 2012).

Neary, J. P., "Trade Costs and Foreign Direct Investment", in S. Brakman and H. Garretsen (Eds), *Foreign Direct Investment and the Multinational Enterprise* (Cambridge: MIT Press, 2008).

OECD, "International Investment Stumbles into 2014 After Ending 2013 Flat", *FDI in Figures*, April (Paris: Organization for Economic Cooperation and Development, 2014).

Resmini, L., "The Determinants of Foreign Direct Investment in the CEECs: New Evidence from Sectoral Patterns", *Economics of Transition*, 8:3 (2000), 665-89.

Riedl, A., "Location Factors of FDI and the Growing Service Economy", *Economics of Transition*, 18:4 (2010), 741-61.

Rode, M. and J. D. Gwartney, "Does Democratization Facilitate Economic Liberalization?", *European Journal of Political Economy*, 28:4 (2012), 607-19.

Serwicka, I., J. Jones and C. Wren, "The Motives for the FDI Location Choice in the 'Old' and 'New' Europe", in J. Jones and C. Wren (eds) *Understanding the Location of Foreign Direct Investment* (London: Palgrave Macmillan, 2016).

Serwicka, I., J. Jones and C. Wren, "Is There a 'West-East Divide' in the Motives for FDI Location in Europe?", (2017) *mimeo*.

Simar, L. and P. W. Wilson, "Inferences from Cross-Sectional, Stochastic Frontier Models", *Econometric Reviews*, 29.1 (2010), 62–98 .